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HOW TO

compare fuel values

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THE CHART

Three sets of lines appear on the chart for the three classes of fuel considered: (1) oil, (2) coal, bark/wood, and municipal solid waste, and (3) gas. A fourth set represents efficiency values to allow for losses when converting heat to steam.

Heating values used for solid fuels are "as-fired," i.e. at the moisture content as burned. If the as-fired value for any moisture-laden fuel is not available, it may be computed as follows:

$$\frac{(100 - \text{moisture content})}{100} \times \text{oven-dry heating value}$$

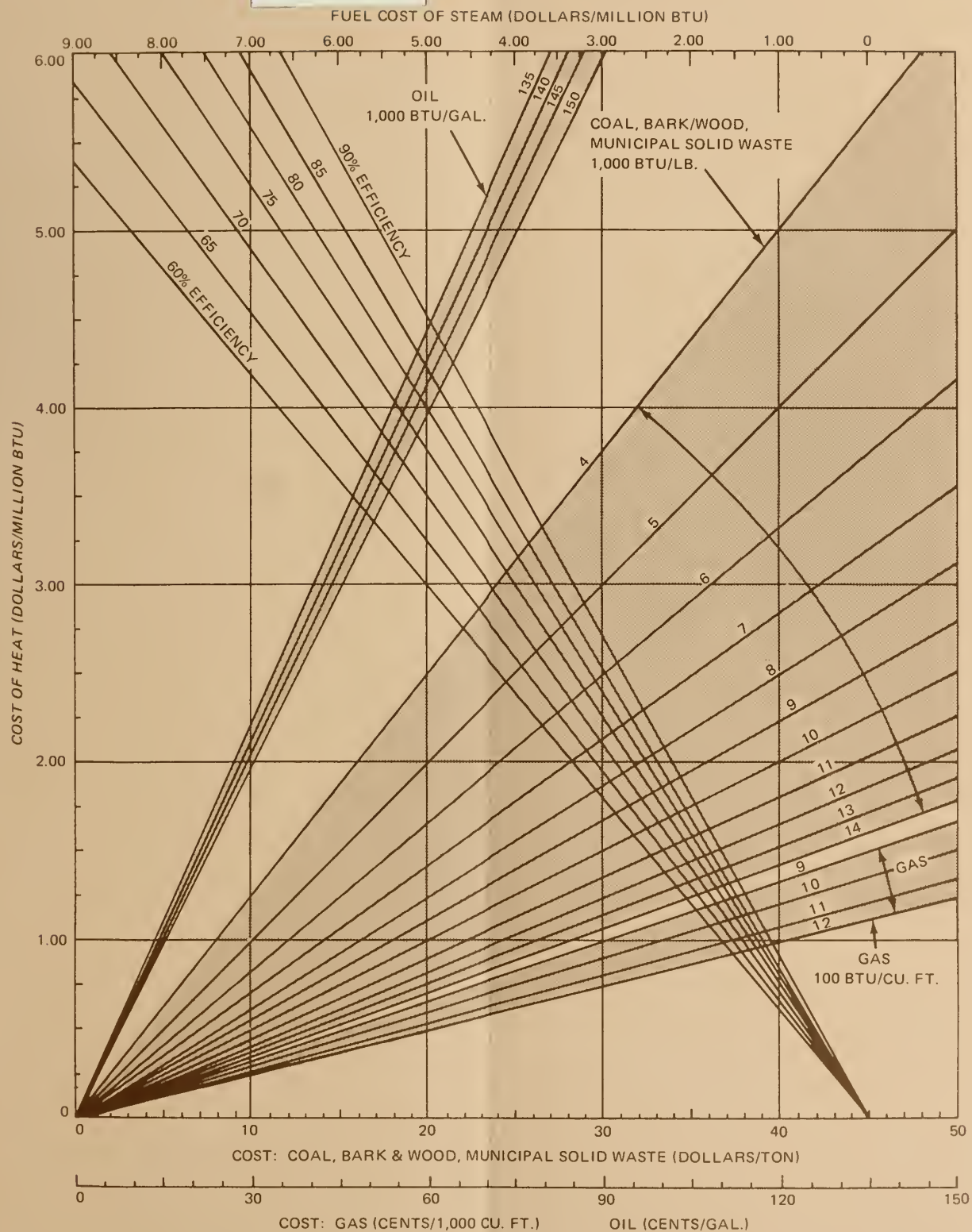
(see table, page 7)

The chart has three primary uses:

- To determine the cost of heat
- To determine the cost of steam
- To compare alternative fuels

See pages 4-6 for examples.

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HOW TO USE THE CHART

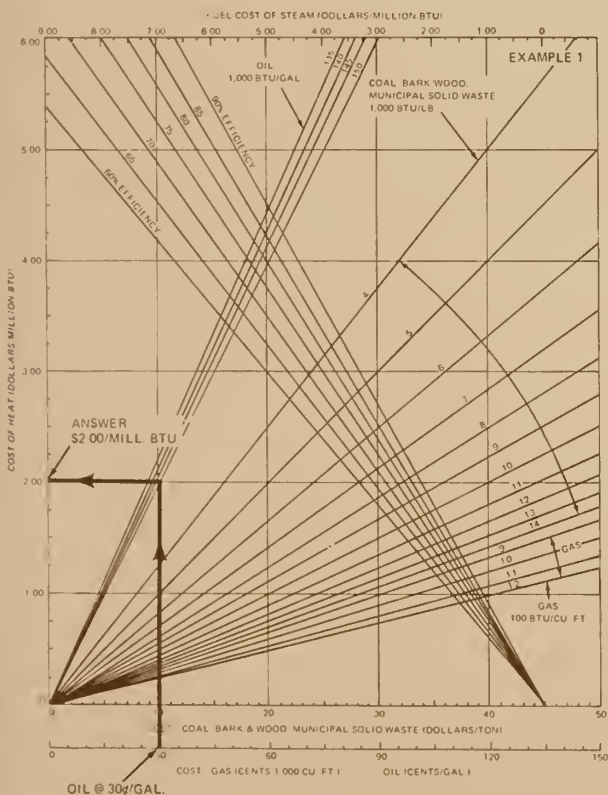
To Determine Cost of Heat

Given: Fuel is oil at 150,000 Btu/gal.
Cost is 30¢/gal.

Problem: What is the cost of heat?

Solution: On lower scale at bottom of chart extend a vertical line from 30¢/gal. to the 150,000 Btu/gal. heating value line for oil. Then extend a line horizontally to the vertical scale and read the cost of heat.

Answer: \$2/million Btu.



To Determine the Cost of Steam

Given: Fuel is bark with an as-fired moisture content of 50% (green weight). Heating value is 9,000 Btu/bone-dry lb. Process efficiency is 65%.

Problem: What is the cost of steam?

Solution: Available heat at 50% moisture is 4,500 Btu/lb. $(1.00 - 0.50) \times 9,000$. From the \$10/ton point along the upper scale at bottom of chart, extend a line vertically to the 4,500 Btu/lb. point for bark (interpolation required). Extend a horizontal line from this intersection to the 65% efficiency line and then a vertical line to the top of the chart to read the cost of steam.

Answer: About \$1.70/million Btu.



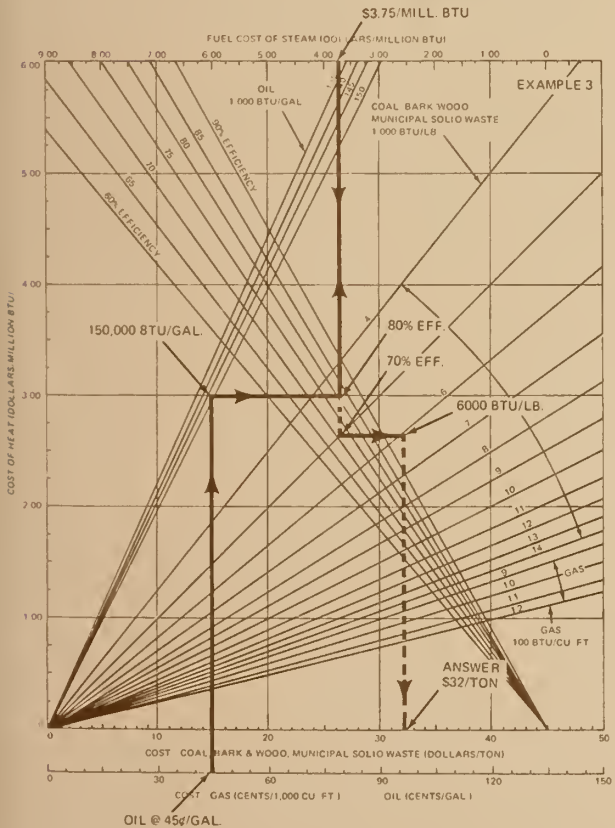
To Compare Alternative Fuels

Given: The price of oil at 150,000 Btu/gal. is 45¢/gal. The process efficiency is 80% when converting to steam.

Problem: What would the as-fired dollar value have to be for bark with a heating value of 6,000 Btu/lb. and a process efficiency of 70% to be equivalent to oil as given above?

Solution: Solve for the cost of steam from oil at the above conditions. This yields \$3.75/million Btu. Now extend a line from the \$3.75/million Btu point down to the 70% efficiency line. Then extend a line horizontally to the 6,000 Btu/lb. line for bark/wood and finally down to read the as-fired value of the bark/wood.

Answer: About \$32/ton.



HEATING VALUES OF THE VARIOUS FUELS

Fuel Oil	<u>1,000 Btu/gal.</u>	<u>Lbs./gal.</u>
No. 1 & 2	136-140	7.05-7.41
No. 3 & 4	141-145	7.23-7.60
No. 5 & 6	146-152	7.70-8.12

Coal	<u>1,000 Btu/lb.</u>
Anthracite	13
Bituminous	10-14
Subbituminous	10
Lignite	7

Bark 7,600-9,900 Btu/lb.

Wood 8,400-9,900 Btu/lb.

Municipal Solid Waste	<u>1,000 Btu/lb.</u>
Commercial	4
Residential	5
Industrial	6

Natural Gas 900-1,200 Btu/cu. ft.

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